

Docket No. 201887US2



2852

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Masumi SATO, et al.
SERIAL NO: 09/758,192
FILED: January 12, 2001
FOR: CHARGING ROLLER HAVING ELASTIC MEMBER

GAU: 2852

EXAMINER: GRAINGER, QUANA M.

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR 1.97

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COMMISSIONER FOR PATENTS
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SIR:

Applicant(s) wish to disclose the following information.

REFERENCES

- The applicant(s) wish to make of record the references listed on the attached form PTO-1449. Copies of the listed references are attached, where required, as are either statements of relevancy or any readily available English translations of pertinent portions of any non-English language references.
- A check is attached in the amount required under 37 CFR §1.17(p).

RELATED CASES

- Attached is a list of applicant's pending application which may be related to the present application. A copy of the claims and drawings of the pending application is attached.
- A check is attached in the amount required under 37 CFR §1.17(p).

CERTIFICATION

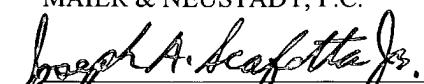
- Each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this statement.
- No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application or, to the knowledge of the undersigned, having made reasonable inquiry, was known to any individual designated in 37 CFR §1.56(c) more than three months prior to the filing of this statement.

DEPOSIT ACCOUNT

- Please charge any additional fees for the papers being filed herewith and for which no check or credit card payment form is enclosed herewith, or credit any overpayment to deposit account number 15-0030. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

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LIST OF RELATED CASES

<u>Docket Number</u>	<u>Serial or Patent Number</u>	<u>Filing or Issue Date</u>	<u>Inventor/Applicant</u>
201887US2*	09/758,192	01/12/01	SATO et al.
238794US3	10/456,583	06/09/03	FUJISHIRO et al.

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WHAT IS CLAIMED IS:

1. An image forming apparatus comprising:
 - a latent image carrier that includes an arrangement of any of a belt and a thin walled hollow cylinder, the latent image carrier having a first surface and a second surface;
 - a bias applying unit that has an arrangement for approaching towards the first surface of the latent image carrier, wherein the bias applying unit sets bias characteristics of the latent image carrier; and
 - a vibration absorber that absorbs vibrations in the latent image carrier, wherein the vibration absorber is made to touch the second surface of the latent image carrier.
2. The image forming apparatus according to claim 1, wherein the latent image carrier is the belt and the vibration absorber is a roller, wherein a surface of the roller is in contact with a surface of the belt, and the surface of the roller is made of a material that absorbs strong vibrations.
3. The image forming apparatus according to claim 1, wherein the latent image carrier is the belt and the vibration absorber is a roller, wherein a surface of the roller is in contact with a surface of the belt, and a material that absorbs strong vibrations is disposed inside the roller.

4. The image forming apparatus according to claim 1, wherein the latent image carrier is the belt and the vibration absorber is a roller, wherein a surface of the roller is in contact with a surface of the belt, and the roller drives the belt.

5

5. The image forming apparatus according to claim 1, wherein the latent image carrier is the belt and the vibration absorber is a rigid and flat supporting plate, wherein a surface of the plate is in contact with a surface of the belt, and a material that absorbs vibrations is provided on 10 a surface of the plate that is on the other side of the surface that makes a contact with the belt.

6. The image forming apparatus according to claim 1, wherein the vibration absorber is disposed in a position facing the bias applying 15 unit.

7. The image forming apparatus according to claim 1, wherein the latent image carrier is a thin belt made of a material that absorbs strong vibrations and the latent image carrier has layer of a photosensitive 20 material on a surface.

8. The image forming apparatus according to claim 1, wherein a tangent of loss $\tan \delta$ of the vibration absorber is greater than or equal to 0.5, wherein the tangent of loss is a value of damping effect.

9. The image forming apparatus according to claim 1, wherein the latent image carrier is the hollow cylinder and the vibration absorber is a solid cylinder that is in contact with an inner surface of the hollow cylinder.

5

10. The image forming apparatus according to claim 1, wherein the latent image carrier is the hollow cylinder and the vibration absorber is a hollow cylinder that is in contact with an inner surface of the hollow cylinder as the latent image carrier.

10

11. The image forming apparatus according to claim 10, wherein a tangent of loss $\tan \delta$ of the vibration absorber is greater than or equal to 0.6, wherein the tangent of loss is a value of damping effect.

15

12. The image forming apparatus according to claim 9, wherein the latent image carrier is the hollow cylinder and the vibration absorber is press fitted inside the hollow cylinder.

13

The image forming apparatus according to claim 10, wherein the latent image carrier is the hollow cylinder and the vibration absorber is press fitted inside the hollow cylinder.

20

14. The image forming apparatus according to claim 9, wherein the latent image carrier is the hollow cylinder and the vibration absorber is fixed with an adhesive inside a hollow portion of the hollow cylinder.

25

15. The image forming apparatus according to claim 10, wherein the latent image carrier is the hollow cylinder and the vibration absorber is fixed with an adhesive inside a hollow portion of the hollow cylinder.

5

16. An image forming apparatus comprising:

a toner image forming unit that forms a toner image on an image carrier drum using a toner having an outflow start temperature less than or equal to 102°C measured by flow tester method; and

10 a damper provided inside the image carrier drum, wherein the damper is made of a material with a tangent of loss $\tan \delta$ of the damper is greater than or equal to 0.5, wherein the tangent of loss is a value of damping effect.

15 17. The image forming apparatus according to claim 16, wherein the toner contains a metallic salt of high fatty acid.

18. The image forming apparatus according to claim 16, wherein the damper is in a solid cylinder.

20

19. The image forming apparatus according to claim 16, wherein the damper is in a hollow cylinder.

25 20. The image forming apparatus according to claim 17, wherein the damper is press fitted inside the image carrier drum.

21. The image forming apparatus according to claim 18, wherein the damper is press fitted inside the image carrier drum.
- 5 22. The image forming apparatus according to claim 19, wherein the damper is press fitted inside the image carrier drum.
23. The image forming apparatus according to claim 16, wherein the damper is fixed with an adhesive on an inner surface of the image
10 carrier drum.
24. The image forming apparatus according to claim 16, further comprising:
a cleaning blade in pressed contact with a surface of the image
15 carrier drum for cleaning the surface after the toner image is transferred; and
a reverse drive mechanism that rotates the image carrier drum in the direction opposite to that when the toner image is formed on the image carrier drum.
- 20
25. The image forming apparatus according to claim 16, wherein the image carrier drum has a protective layer on a surface.

26. The image forming apparatus according to claim 25, wherein the protective layer contains a filler.
27. The image forming apparatus according to claim 25, wherein the protective layer contains a material that carries charge.
28. The image forming apparatus according to claim 16, further comprising:
an image forming module that includes at least the image carrier
10 drum and a cleaning blade that cleans a surface of the image carrier
drum after the toner image is transferred; and
an environment control unit that controls either of temperature
and moisture inside the image forming module to be less than or equal
to a predetermined value.
- 15
29. A drum unit, comprising:
a cylinder;
a shaft that extends inside and supports the cylinder; and
a damper disposed inside the cylinder, wherein
20 the cylinder, the shaft, and the damper are assembled such that
when the shaft is pulled out from the cylinder, the damper moves in the
axial direction of the cylinder together with the shaft and is removed
from the cylinder.

30. The drum unit according to claim 29, wherein the shaft has a protrusion in radial direction and away from a center of the shaft, the damper has a contacting portion that comes in contact with the protrusion when the shaft is pulled out from the cylinder.

5

31. The drum unit according to claim 30, wherein the contacting portion is in a front end of the direction of movement of the damper.

32. The drum unit according to claim 29, wherein the damper is
10 coupled together with the shaft such that the damper can move together with the shaft when the shaft is pulled out from the cylinder.

33. The drum unit according to claim 29, wherein the mechanism is such that each end in the axial direction of the cylinder has a pair of
15 flanges fitted respectively, the cylinder is supported by the shaft through these flanges, the damper moves in the axial direction of the cylinder and comes in contact with one of the flanges, and the flange is separated apart from the cylinder by pushing.

20 34. The drum unit according to claim 33, wherein the damper that comes in contact with the flange is made of a rigid body.

35. The drum unit according to claim 33, wherein the damper that comes in contact with the flange is made of an elastic body.

25

36. The drum unit according to claim 33, wherein one of the flanges has a first cylinder member that fits at the end of the axial direction of the cylinder, a second cylinder member fitted in the first cylinder member that presses the first cylinder member against an inner wall surface of the cylinder, the damper moves in the axial direction of the cylinder, and a front end surface of the damper comes in contact with only the second cylinder member out of the two cylinder members and presses the second cylinder member.
- 5
- 10 37. The drum unit according to claim 29, wherein the damper is in pressed contact with an inner wall surface of the cylinder and is fixed due to elasticity.
- 15
38. The drum unit according to claim 33, wherein the cylinder, the pair of flanges, and the shaft are assembled together to rotate as an integrated assembly.
- 20
39. The drum unit according to claim 37, wherein the cylinder, the pair of flanges, and the shaft are assembled together to rotate as an integrated assembly.
40. The drum unit according to claim 29, wherein the cylinder includes an image carrier drum.

41. An image forming module, comprising:
- an image carrier drum;
 - a shaft that extends inside and supports the drum;
 - a damper disposed inside the drum, wherein the drum, the shaft,
- 5 and the damper are assembled such that when the shaft is pulled out from the drum, the damper moves in the axial direction of the drum together with the shaft and is removed from the drum; and
- an image forming element that forms an image on the drum,
- wherein
- 10 the image carrier drum and the image forming element are assembled together as an integrated assembly.
42. An image forming apparatus comprising:
- an image carrier drum;
 - 15 a shaft that extends inside and supports the drum; and
 - a damper disposed inside the drum, wherein the drum, the shaft,
- and the damper are assembled such that when the shaft is pulled out from the drum, the damper moves in the axial direction of the drum together with the shaft and is removed from the drum.
- 20
43. A method of insertion and removal of a damper into and from an image carrier drum, comprising:
- inserting the damper into the image carrier drum from an opening on one end in an axial direction of the image carrier drum and
- 25 thereby mounting the damper inside the drum; and

removing the damper from an opening on other end in the axial direction of the image carrier drum.

44. The method according to claim 43, wherein
- 5 the inserting includes moving the damper in the axial direction of the image carrier drum by exerting an external force by a force imparting member to thereby mount the damper inside the drum, and
- the removing includes moving the damper inside the drum in the axial direction of the drum by exerting an external force by the force
- 10 imparting member to thereby remove the damper from the image carrier drum.
45. The method according to claim 44, wherein the force imparting member is a shaft that is disposed inside the image carrier drum and
- 15 supports the image carrier drum.
46. A drum unit comprising:
- an image carrier drum; and
- a damper, wherein the damper is inserted into the image carrier
- 20 drum from an opening on one end in an axial direction of the image carrier drum to thereby mount the damper inside the drum, and the damper mounted inside the drum is removed from an opening on other end in the axial direction of the image carrier drum.

47. The drum unit according to claim 46, wherein the damper has elasticity and the damper is held inside the image carrier drum by a pressed contact due to the elasticity with an inner surface of the image carrier drum.

5

48. The drum unit according to claim 46, wherein the damper is fixed with an adhesive on an inner surface of the image carrier drum.

49. The drum unit according to claim 46, further comprising a force
10 imparting member, wherein

the damper is moved in the axial direction of the image carrier drum by exerting an external force by the force imparting member to thereby mount the damper inside the drum, and

the damper is moved inside the drum in the axial direction of the
15 drum by exerting an external force by the force imparting member to thereby remove the damper from the image carrier drum.

50. The drum unit according to claim 49, wherein the damper has an engaging portion at the front end in the direction of movement when the
20 damper moves in the axial direction inside the image carrier drum, in which the force imparting member engages and the damper is moved in the axial direction of the image carrier drum by the external force exerted by the force imparting member on the engaging portion in the direction of movement of the damper.

51. The drum unit according to claim 50, wherein at least a part of an outer diameter of the damper is made to contract by the external force exerted by the force imparting member on the engaging portion in the axial direction of the image carrier drum.

5

52 The drum unit according to claim 50, wherein the damper is moved inside the image carrier drum by pushing the engaging portion of the damper by the force imparting member from one end to the other end of the image carrier drum.

10

53. The drum unit according to claim 50, wherein the damper is moved inside the image carrier drum by pulling the engaging portion of the damper by the force imparting member from one end towards the other end of the image carrier drum.

15

54. The drum unit according to claim 49, wherein the force imparting member is a shaft that is disposed inside the image carrier drum and supports the image carrier drum.

20 55. The drum unit according to claim 50, wherein the damper has a cylindrical portion, which has an outer peripheral surface that is fixed with respect to the inner peripheral surface of the image carrier drum; and

25 an edge wall that is integrated at the front end in the direction of movement of the cylindrical portion and the edge wall is included in the

engaging portion.

56. The drum unit according to claim 55, wherein the engaging portion, which includes the edge wall, has a hole of diameter bigger
5 than that of a shaft that supports the image carrier drum, and the shaft can be passed through the hole.

57. The drum unit according to claim 46, wherein the damper includes a compression coil spring.

10

58. The drum unit according to claim 46, wherein, the damper that has to be removed from the image carrier drum when moved inside the image carrier drum, pushes and separates apart a flange that is fixed on the image carrier drum.

15

59. The drum unit according to claim 58, wherein the flange is fitted to the drum by either of press fit and clearance fit.

60. The drum unit according to claim 58, wherein the flange includes
20 a first flange member that fits in the opening on the other side in the axial direction of the image carrier drum; and
a second flange member that is fitted on the first flange member and makes the first flange member to have pressed contact with the inner peripheral surface of the image carrier drum, wherein
25 a front edge surface of the damper comes in contact with the

second flange member and pushes the second flange member when the damper that has to be removed from the image carrier drum is moved inside the image carrier drum.

5 61. An image forming module, comprising:

a drum unit having

an image carrier drum; and

10 a damper, wherein the damper is inserted into the image carrier drum from an opening on one end in an axial direction of the image carrier drum to thereby mount the damper inside the drum, and the damper mounted inside the drum is removed from an opening on other end in the axial direction of the image carrier drum; and

15 an image forming unit that forms a toner image on the image carrier drum, wherein

the drum unit and the image forming unit are detachable from a main body of the image forming apparatus.

62. An image forming apparatus comprising an image forming module including

20 a drum unit having

an image carrier drum; and

25 a damper, wherein the damper is inserted into the image carrier drum from an opening on one end in an axial direction of the image carrier drum to thereby mount the damper inside the drum, and the damper mounted inside the drum is removed from an opening on

other end in the axial direction of the image carrier drum; and
an image forming unit that forms a toner image on the image
carrier drum, wherein

the drum unit and the image forming unit are detachable from a

- 5 main body of the image forming apparatus.

63. The image forming apparatus according to claim 62, wherein the toner image is formed on the image carrier drum using a toner having outflow start temperature lower than or equal to 102°C measured by
10 flow tester method and the damper is made of a material that has a tangent of loss tan δ greater than or equal to 0.5.

64. An image forming apparatus comprising a drum unit having an image carrier drum to form a toner image; and
15 a damper, wherein the damper is inserted into the image carrier drum from an opening on one end in an axial direction of the image carrier drum to thereby mount the damper inside the drum, and the damper mounted inside the drum is removed from an opening on other end in the axial direction of the image carrier drum.

20

65. The image forming apparatus according to claim 64, wherein the toner image is formed on the image carrier drum using a toner having outflow start temperature lower than or equal to 102°C measured by
flow tester method and the damper is made of a material that has a
25 tangent of loss tan δ greater than or equal to 0.5.

ABSTRACT OF THE DISCLOSURE

An image forming apparatus includes a photoreceptor belt formed by either a belt or a thin-walled cylinder. A charging unit that sets bias characteristics of the photoreceptor belt has an arrangement 5 to approach towards the photoreceptor belt. A damper is provided on a side of the photoreceptor belt opposite to the side facing the charging unit. The damper absorbs vibrations in the photoreceptor belt through a supporting plate.

FIG. 1

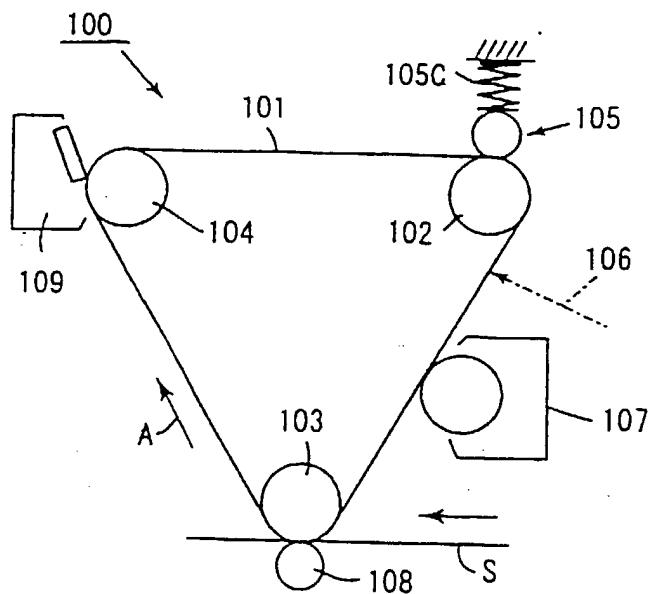
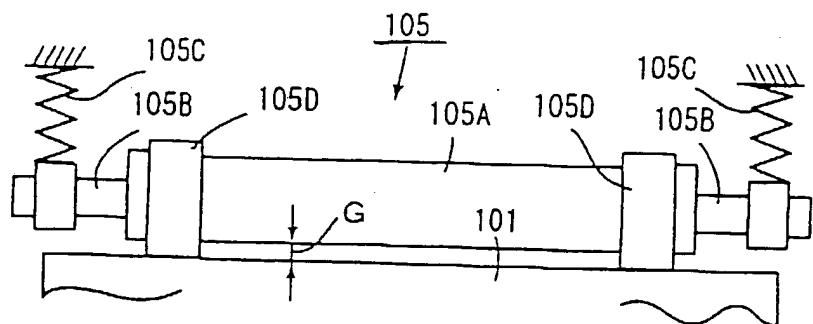


FIG. 2



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FIG. 3

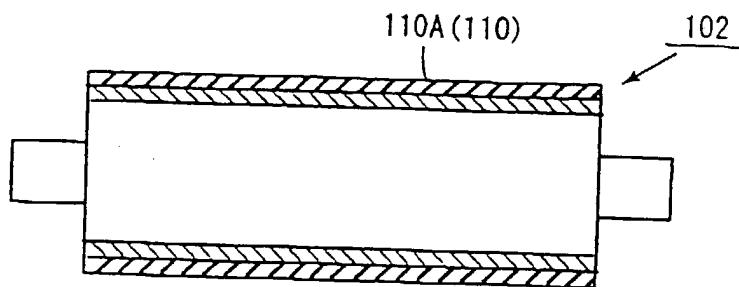


FIG. 4

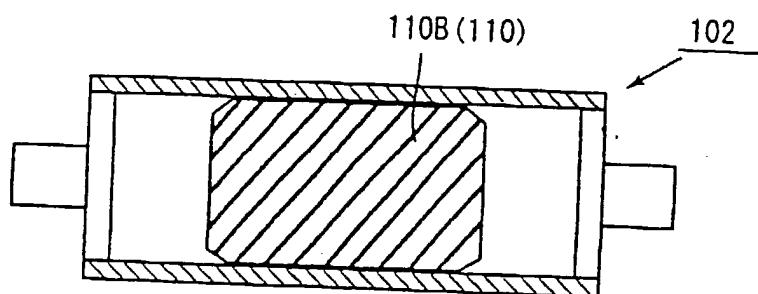


FIG. 5

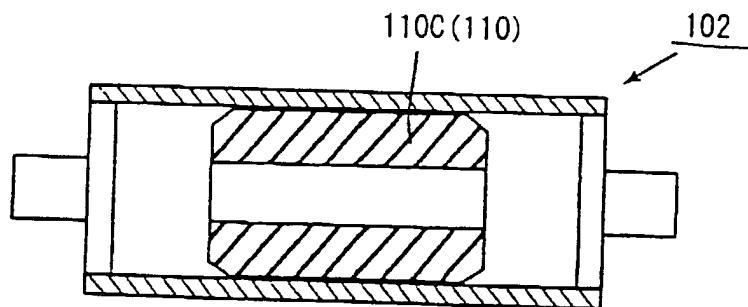


FIG. 6

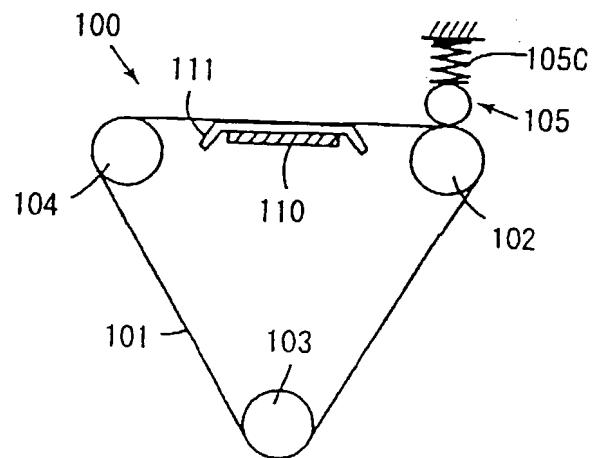


FIG. 7

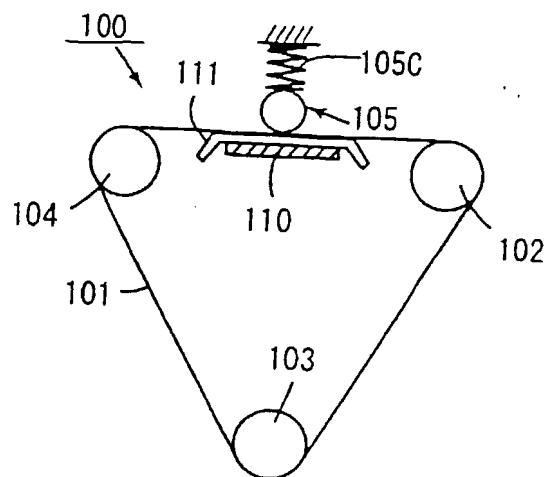


FIG. 8

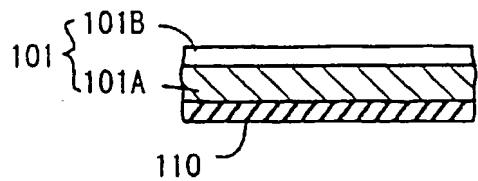
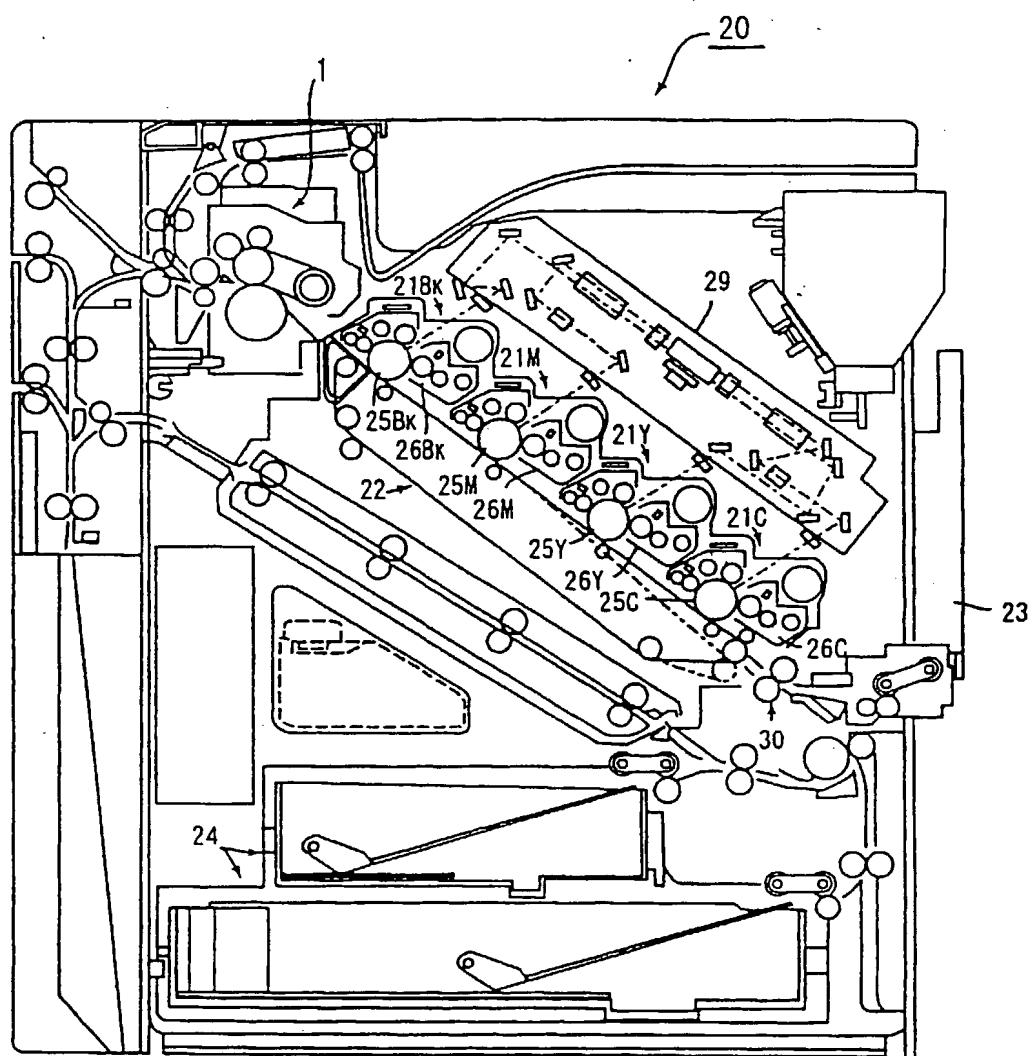


FIG. 9



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FIG. 10

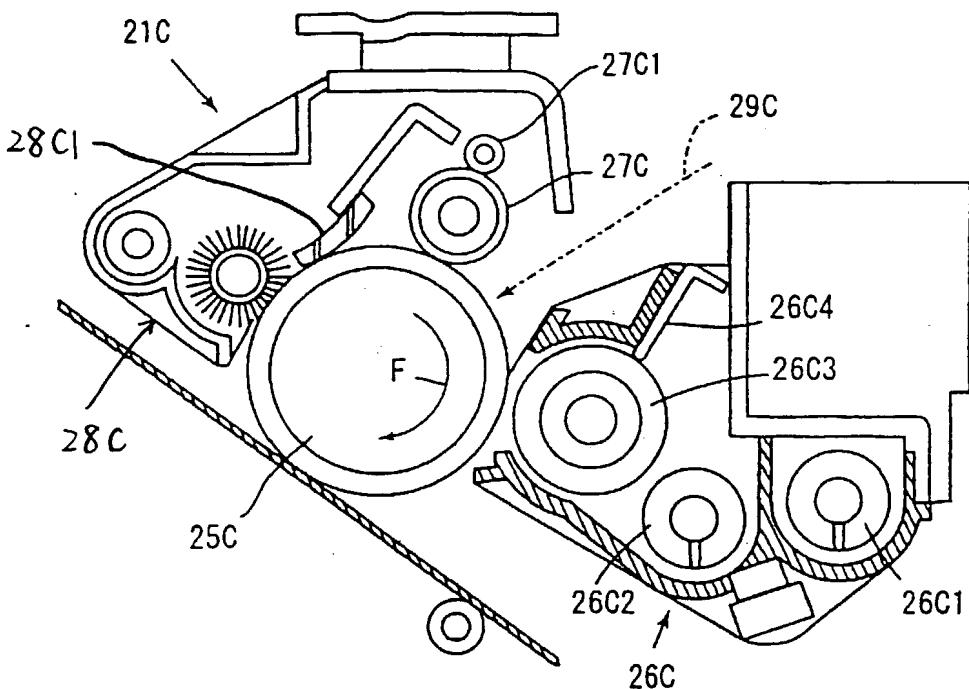


FIG. 11

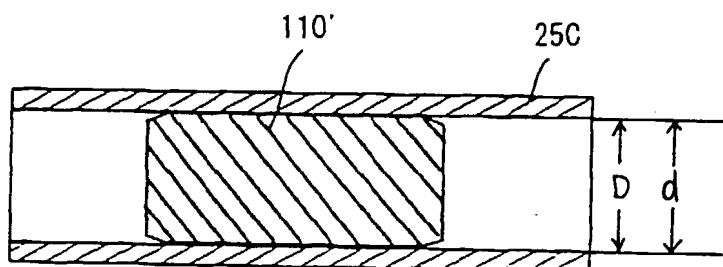


FIG. 12

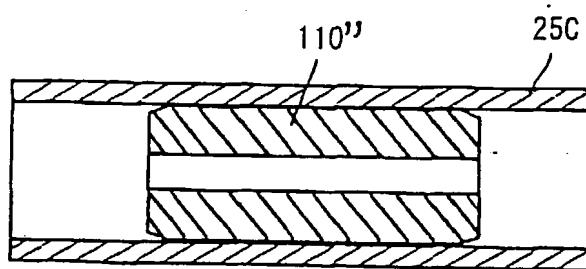


FIG. 13

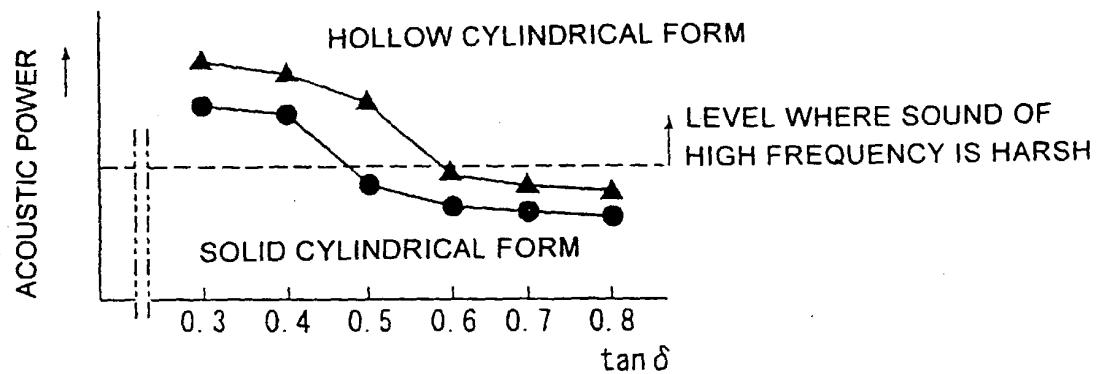
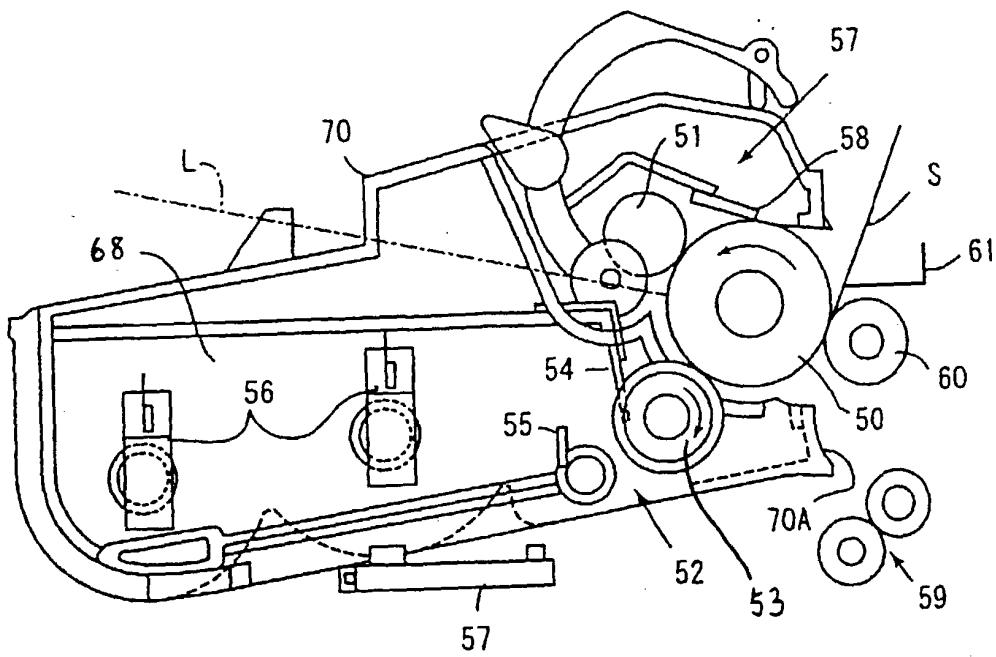


FIG. 14



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FIG. 15

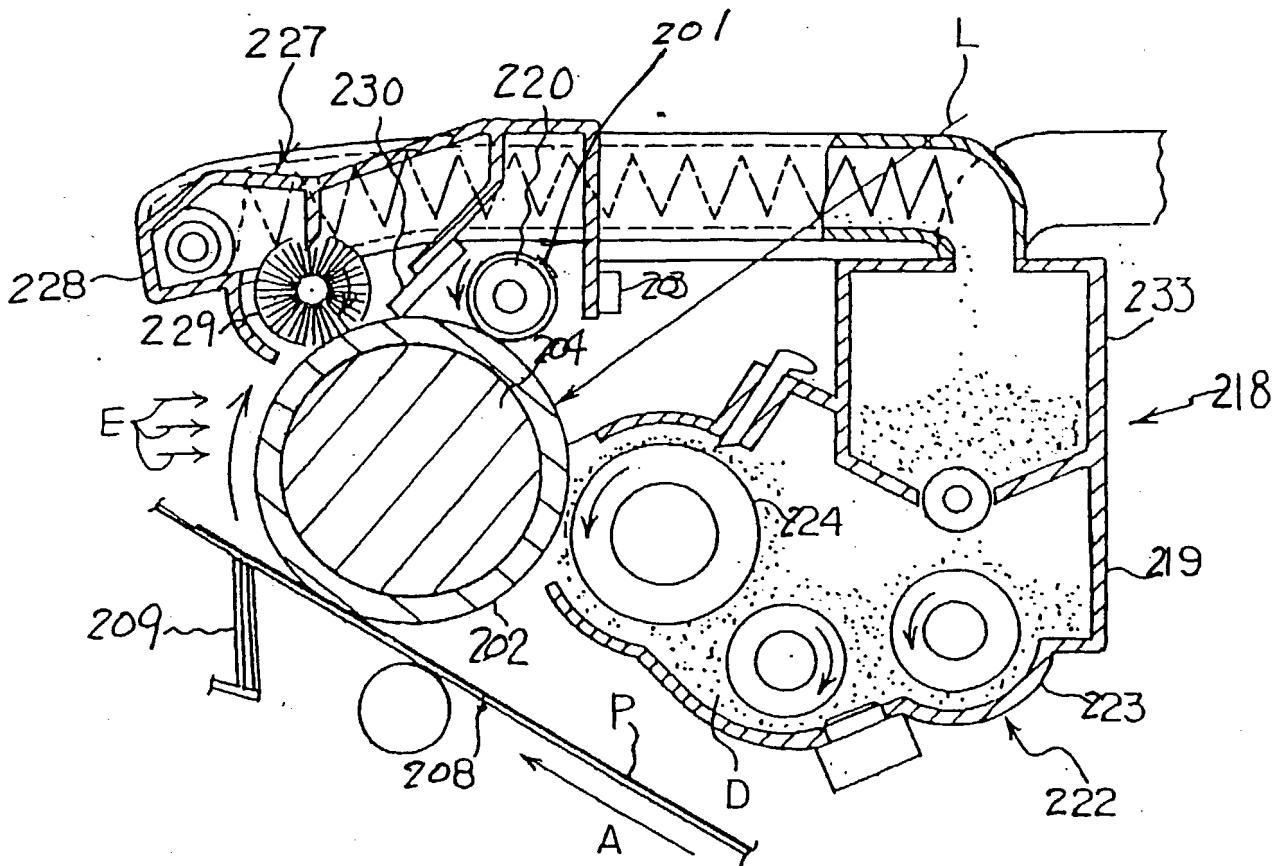


FIG. 16

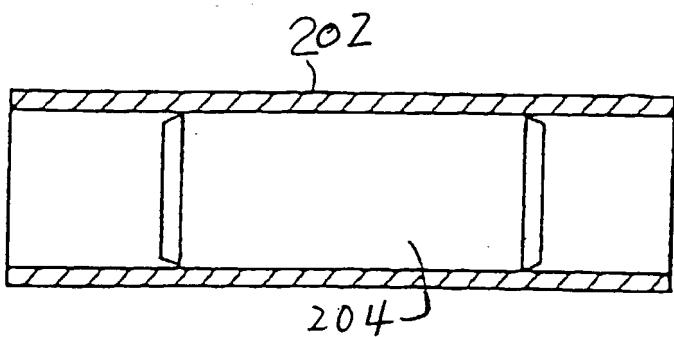


FIG. 17

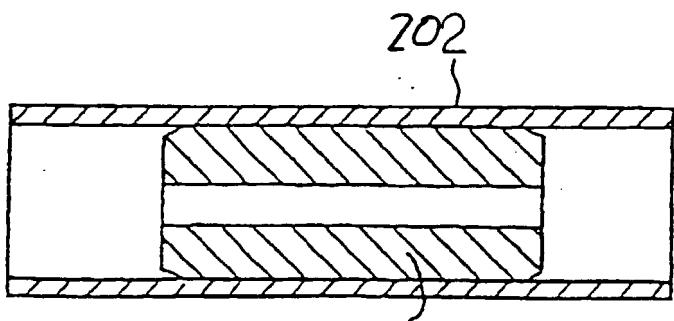


FIG. 18

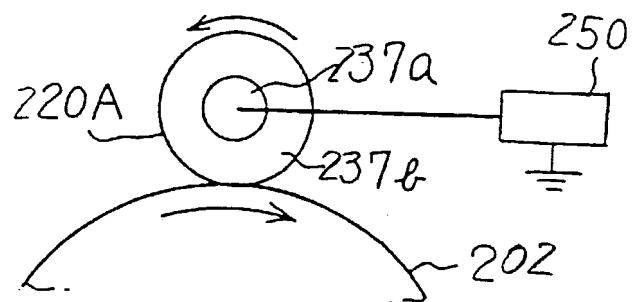


FIG. 19

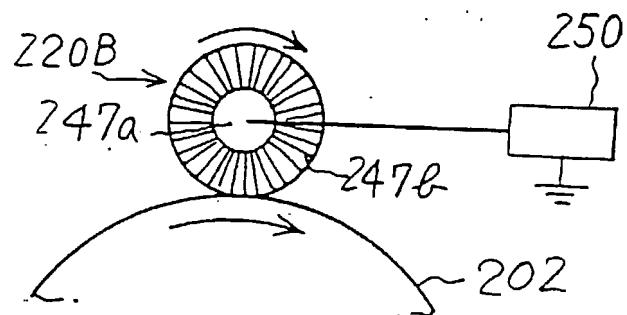
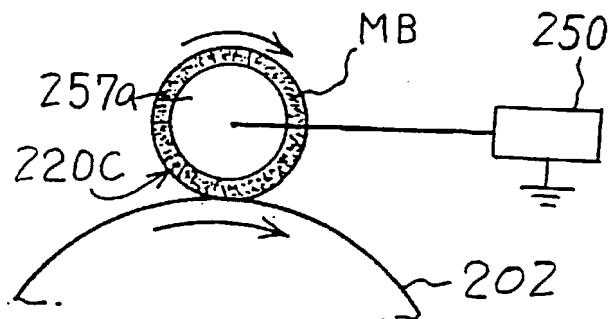


FIG. 20



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FIG. 21

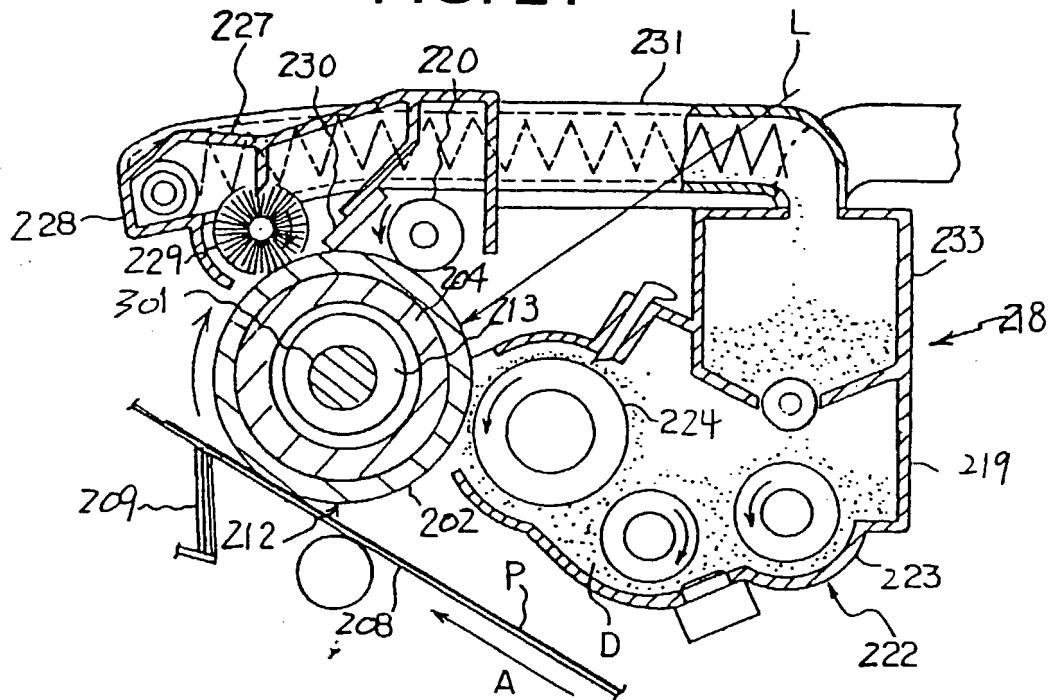


FIG. 22

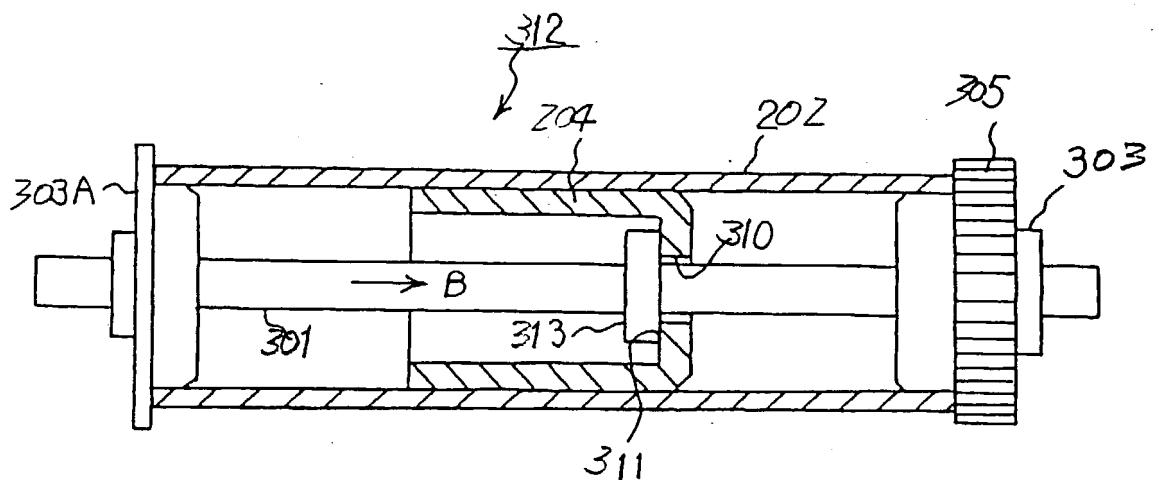
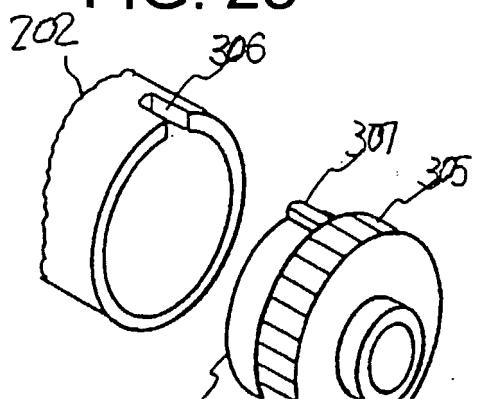


FIG. 23



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FIG. 24

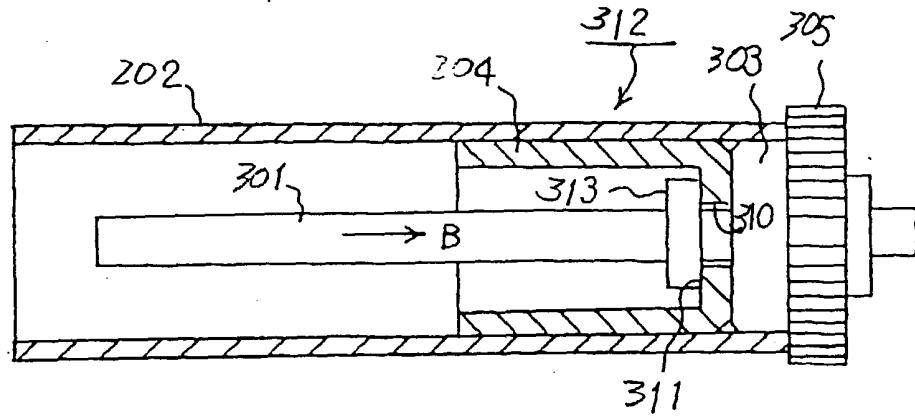


FIG. 25

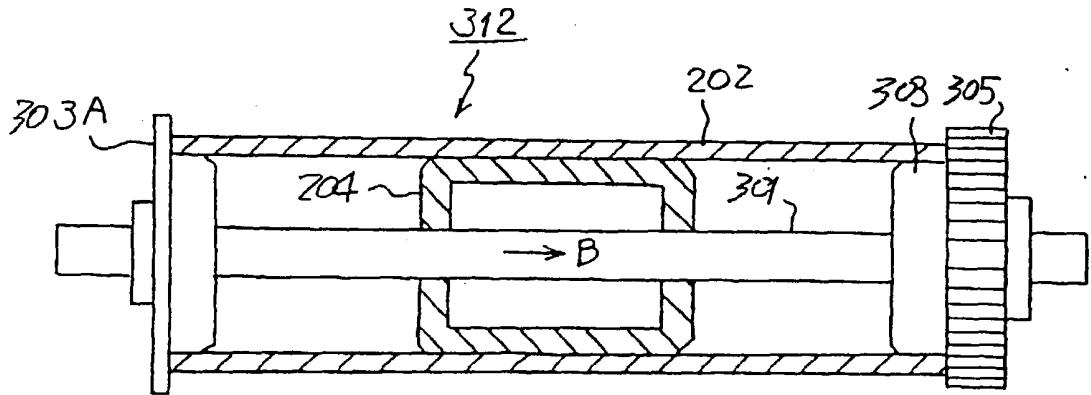
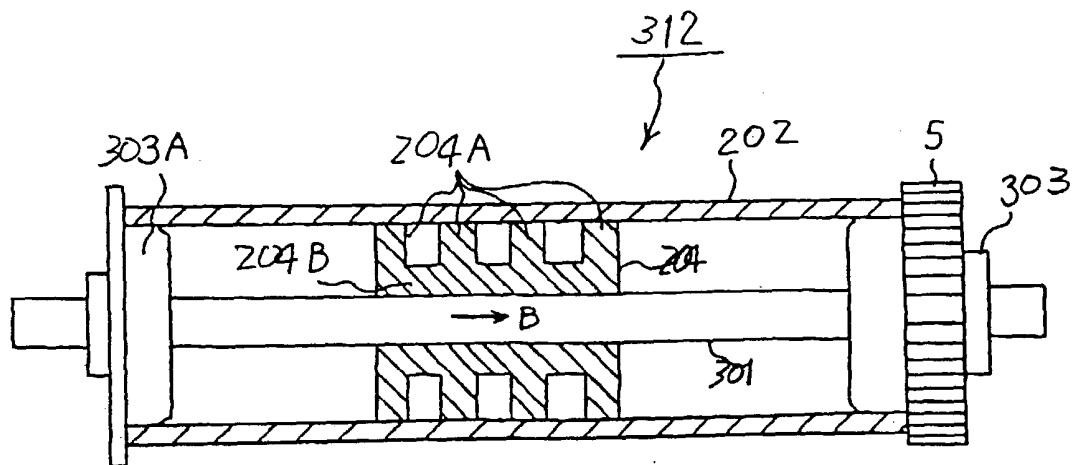


FIG. 26



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FIG. 27

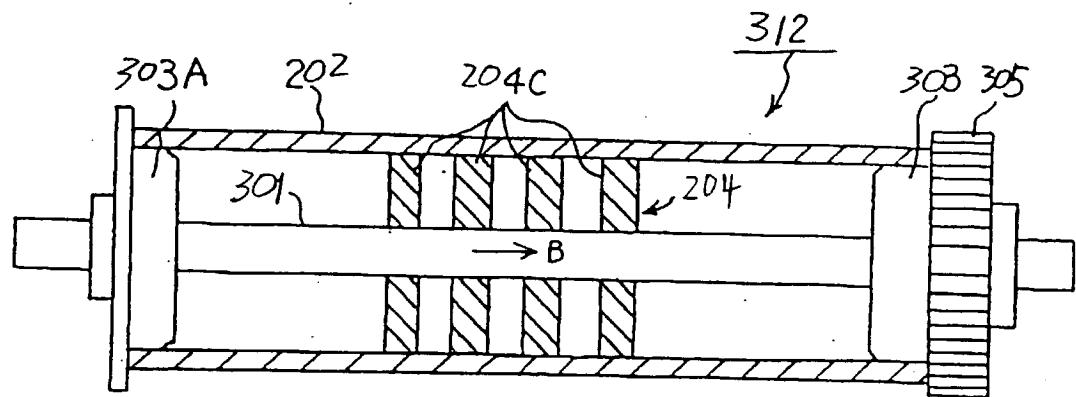


FIG. 28

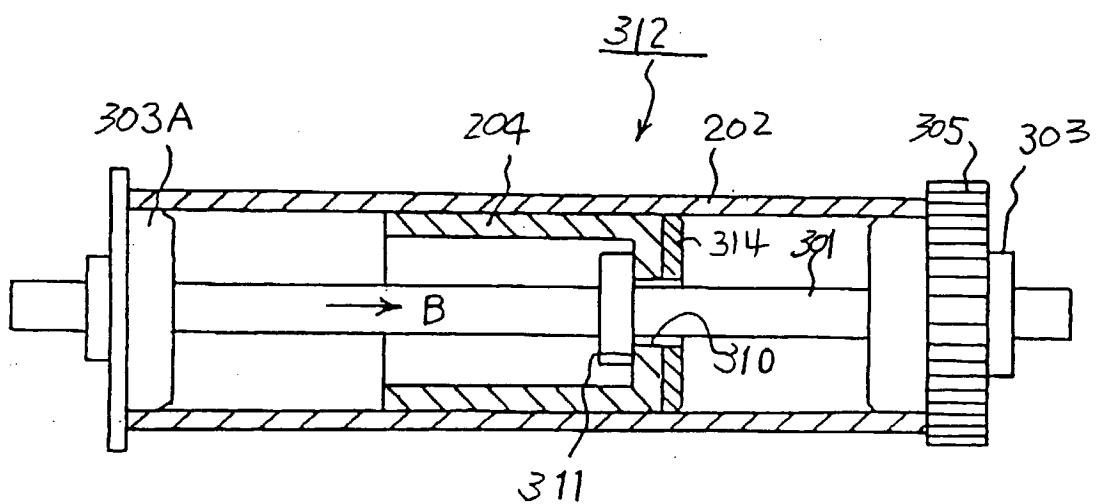
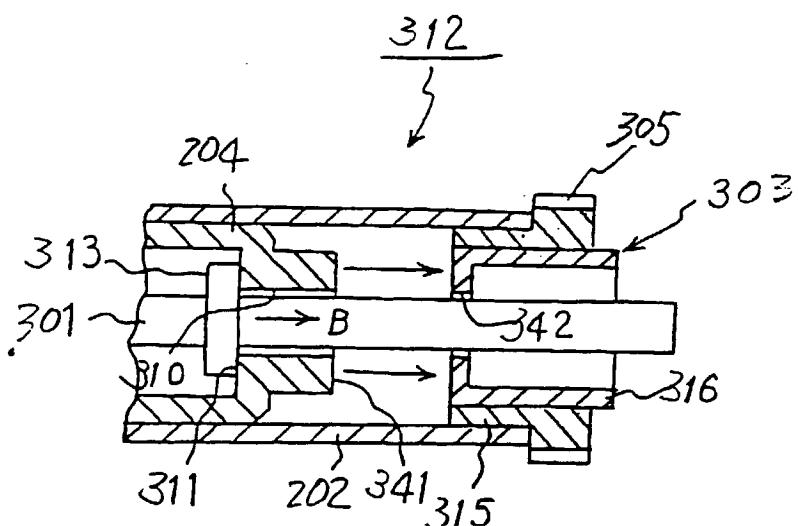


FIG. 29



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FIG. 30

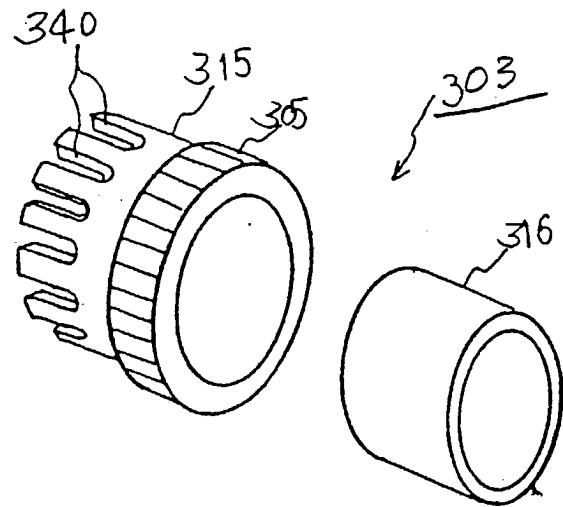


FIG. 31

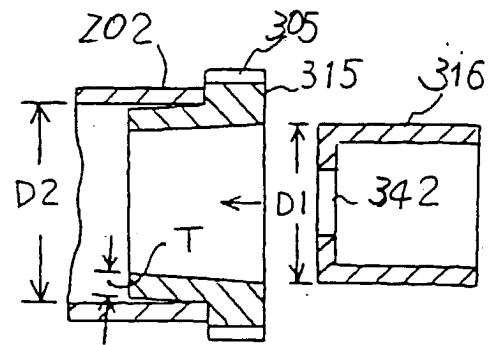
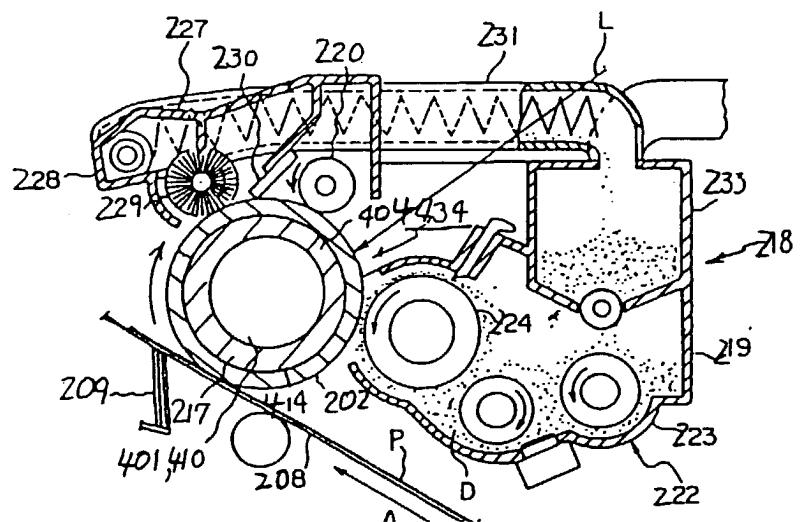


FIG. 32



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FIG. 33

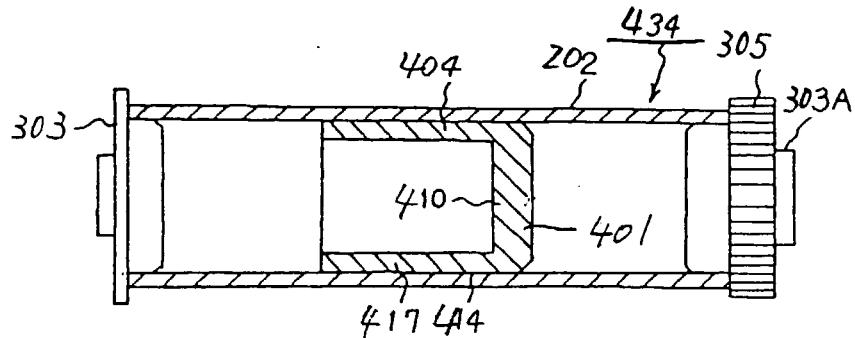


FIG. 34

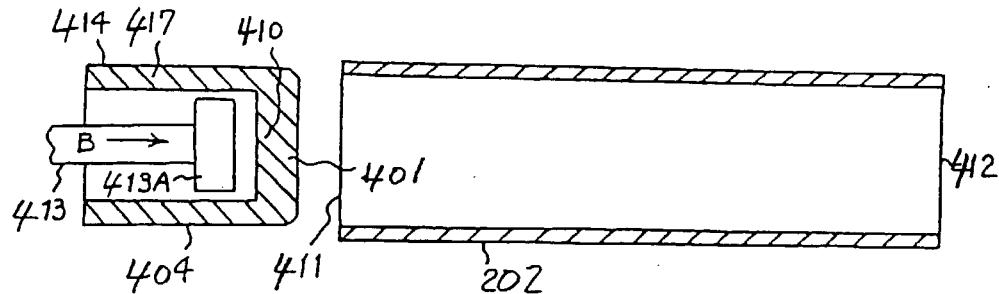


FIG. 35

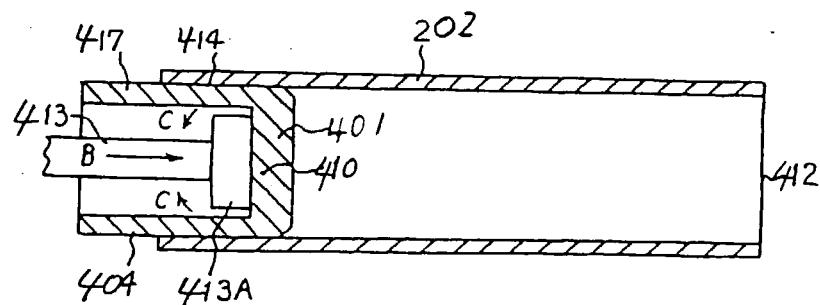
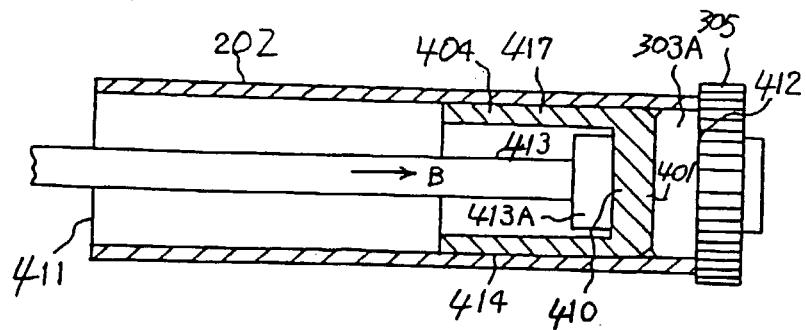


FIG. 36



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FIG. 37

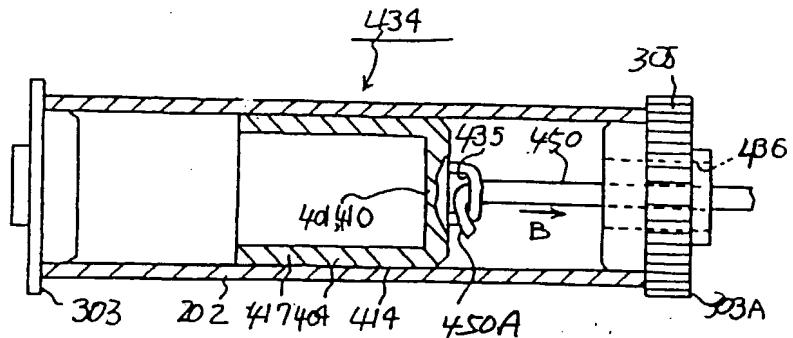
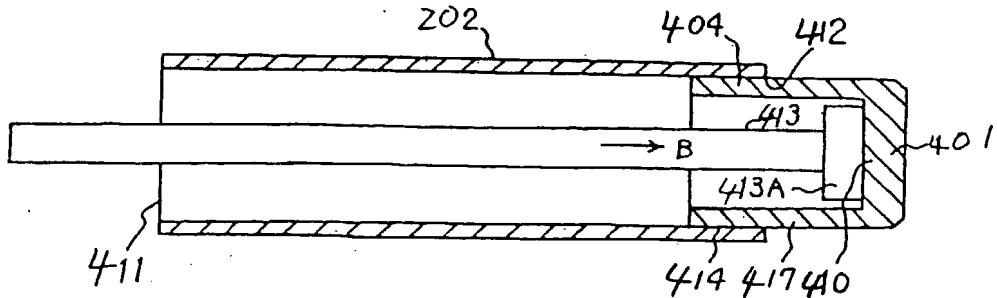


FIG. 39

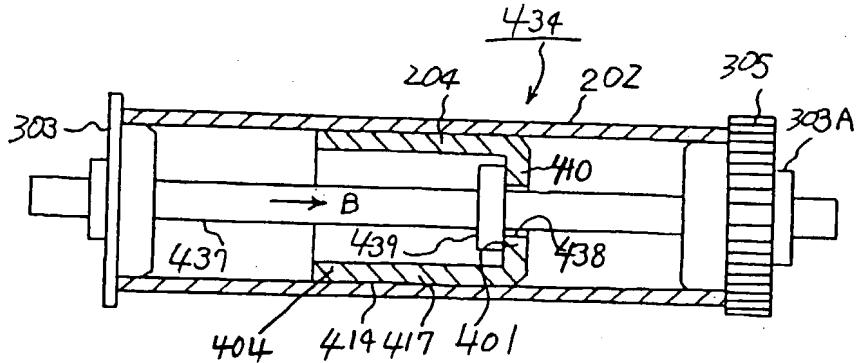
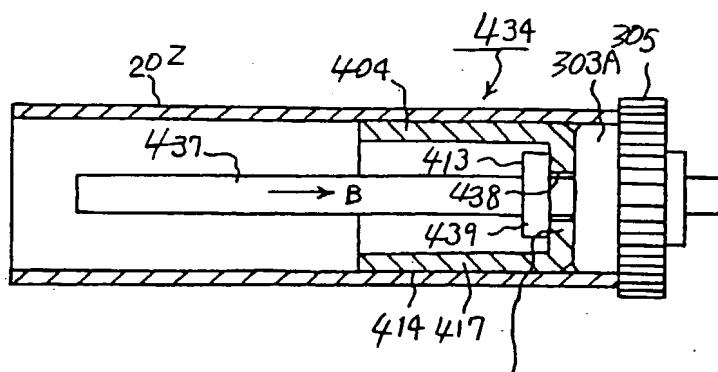


FIG. 40



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FIG. 41

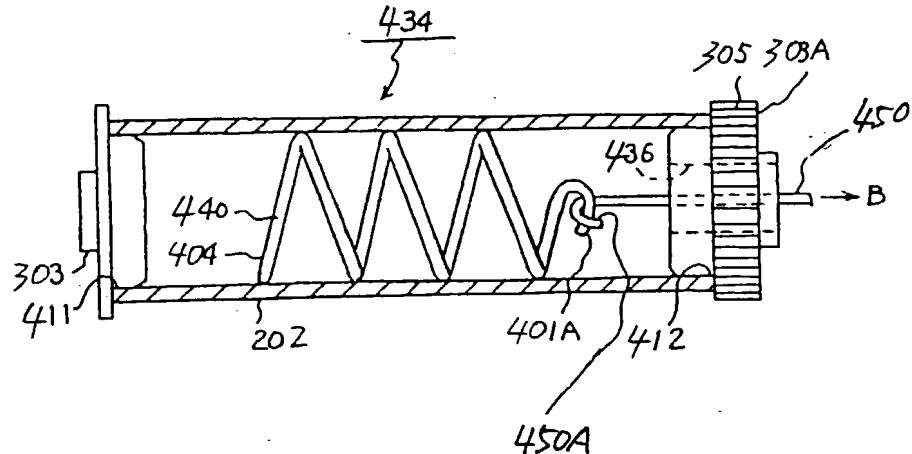


FIG. 42

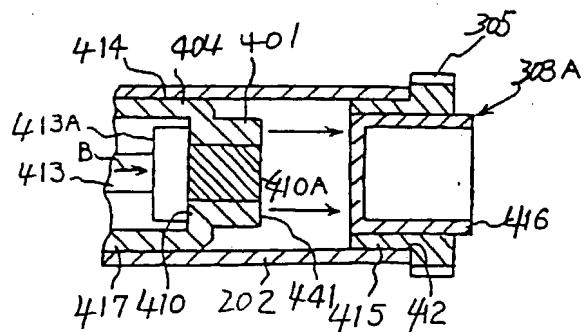
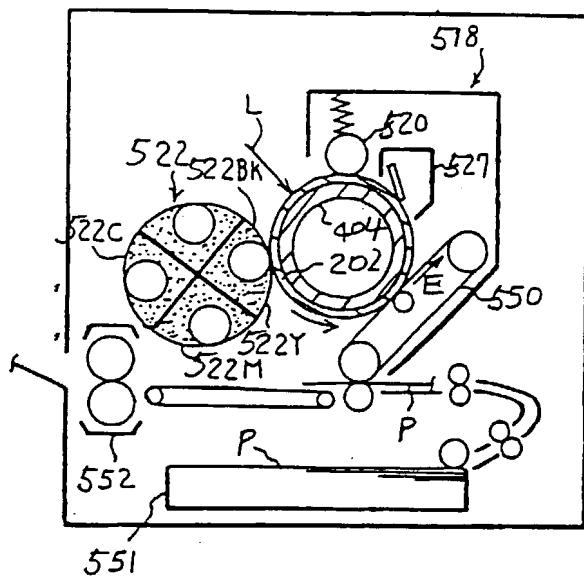


FIG. 43



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FIG. 44

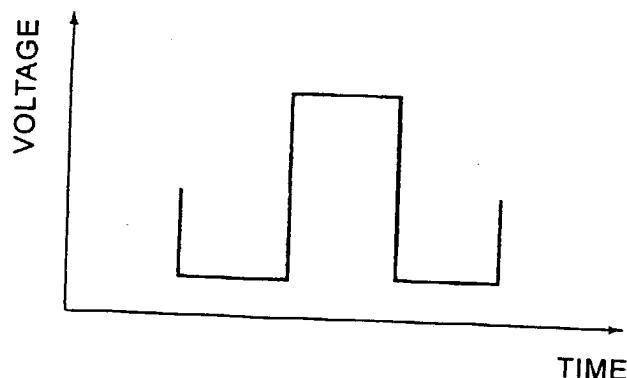


FIG. 45

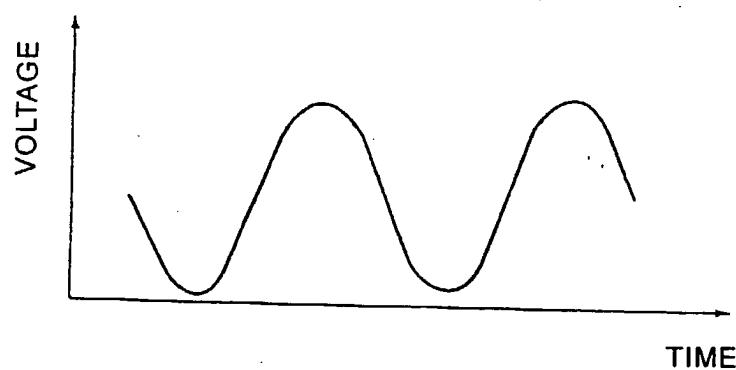


FIG. 46

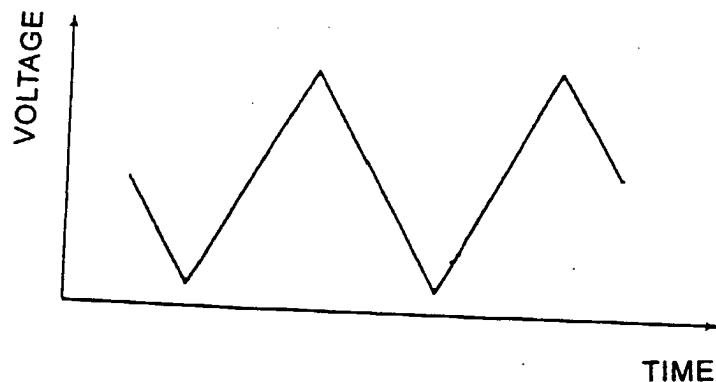


FIG. 47

